Chapter 1

WHAT IS THE WARNING DECISION SUPPORT SYSTEM (WDSS)?

The NSSL severe-weather Warning Decision Support System (WDSS) consists of several enhanced or new WSR-88D severe weather detection and prediction algorithms as well as innovative display capabilities that provide information to warning meteorologists to support decision-making during times of severe/hazardous weather.

The Warning Decision Support System (WDSS) consists of the following parts (see Figure 1):

1) Real-time Ingest and Data Dissemination System (RIDDS): Real-time radar data are ingested from a wideband port on the WSR-88D Radar Products Generator (RPG) into a RISC-based workstation. Data ingest also includes cloud-to-ground lightning data and satellite (at some sites).

2) Radar Utilities for Doppler Data Streams (RUDDS), which includes a clutter-residue editing algorithm (CREMS), proposed Build 10.0 (optimized) velocity-dealiasing, a Velocity Azimuth Display (VAD) algorithm, and a high-resolution image system which produces base reflectivity, composite reflectivity, base velocity, and spectrum width image data files for display. There are also algorithms which process other data streams (some in conjunction with Doppler radar data), including lightning, surface observations, numerical model data, precipitation, and satellite data.

3) Severe Storm Analysis Program (SSAP): A suite of NSSL-enhanced WSR-88D severe weather detection and prediction algorithms.

4) Radar and Algorithm Display System (RADS): A graphical user interface used to display high-resolution radar images, and algorithm output in the form of overlays, tables, and trends.
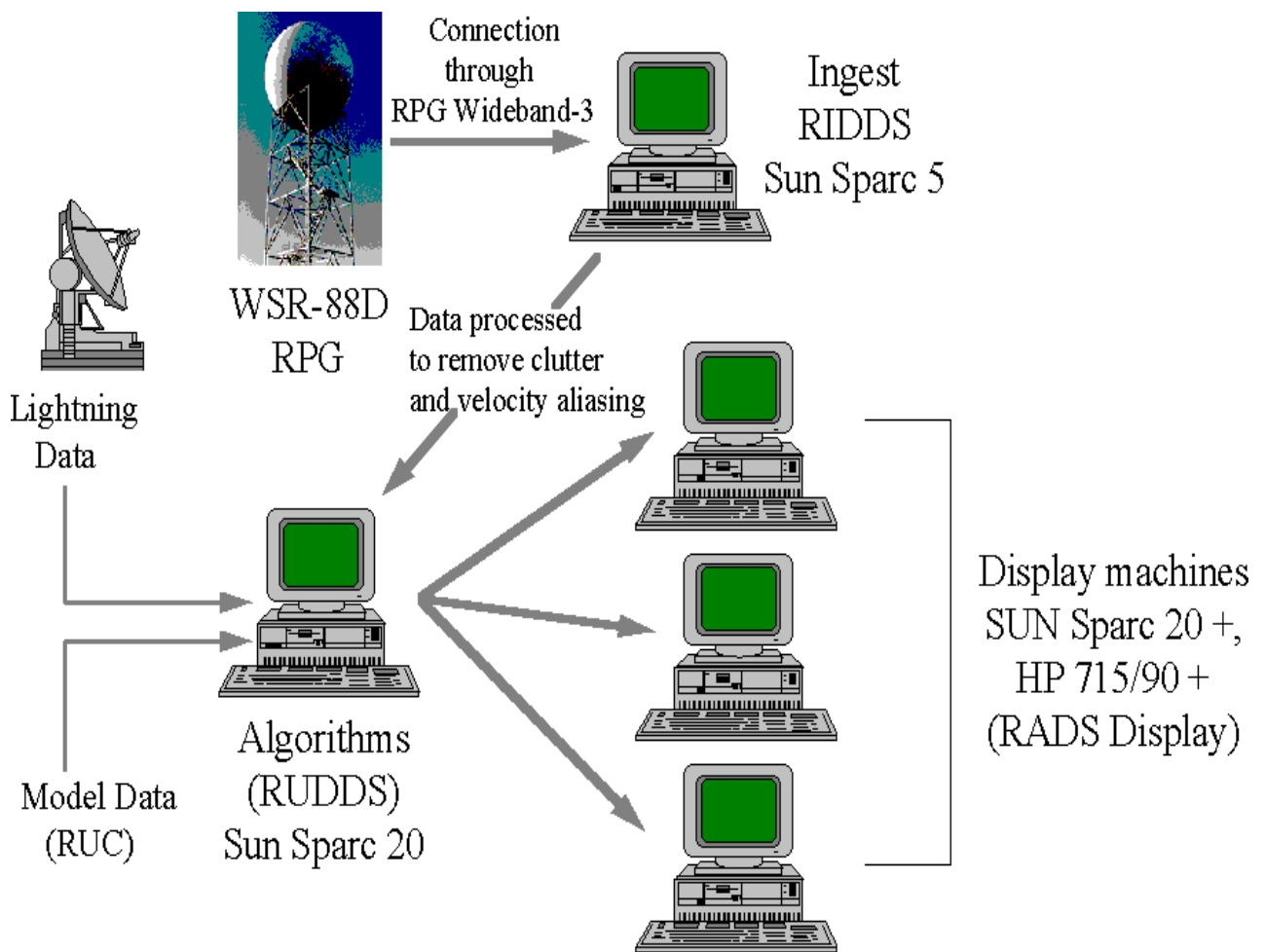
Figure 1.1 WDSS components and data flow.

The NSSL WDSS contains a variety of new algorithm and display capabilities that are either enhancements to the capabilities of the WSR-88D system and the Principle User Processor workstation (PUP), or capabilities that are not available on the current WSR-88D system.

The Severe Storms Analysis Program (SSAP) consists of:

1)   An enhanced Mesocyclone Detection Algorithm (MDA), which includes vertically-integrated strength index (MSI), Neural Network-derived probability functions, and a mesocyclone tracking function.

2)   An enhanced Tornado Detection Algorithm (TDA) and a tornado tracking function.

3)   The Build 9.0 Hail Detection Algorithm (HDA) with probability products and near-storm environmental thermodynamic data input.

4)   The Build 9.0 Storm Cell Identification and Tracking (SCIT) algorithm.

5)   A new Damaging Downburst Prediction and Detection Algorithm (DDPDA) to predict and detect severe downburst winds at the surface.

Other WDSS algorithms include:

1)   The WSR-88D Precipitation Algorithm.

2)   A new Bounded Weak Echo Region (BWER) detection algorithm.

3)   A Near-Storm Environment Algorithm which will ingest Rapid-Up-date Cycle (RUC) model output and create gridded data for use by several SSAP algorithms.

4)   A new Lightning Association Algorithm (LAA) which associates lightning ground-strike and polarity data with storm cells.

5)   New satellite imagery (visible, infrared, and water vapor) and satellite cloud-top analysis algorithm.

The new algorithm product display capabilities in RADS include, but are not limited to:

1) *Trends* of important severe weather parameters associated with each storm cell or storm-scale circulation (mesocyclones, TVSs, or weaker circulation features).

2) *Time-height cross-sections* of certain detection attributes (e.g., MDA rotational velocity).

3) Interactive Cell, Mesocyclone, and Tornado Tables in which output is both ranked according to severity and color coded for quick reference.

4) Numerous static overlay options, such as algorithm detection icons, intermediate algorithm output (e.g., MDA 2D features), MDA and TDA tracks, a storm-cell attribute-trend alarm, and lightning overlays.

5) Image looping.

6) Multi-panel displays (2, 4, 6, or 8 panels) which can be used to interrogate the 3-D structure of the data from a single volume scan.

7) Vertical cross sections.
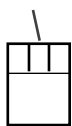
Mouse Buttons:

A "mouse" is a point-and-click device that allows a user to select windows, icons, etc., in an X Windows system. A mouse aids in indicating specific points on a radar image, and performing specific tasks in RADS.   A mouse on a UNIX system usually has three different buttons, which may be programmed to perform different tasks, as is the case with RADS.
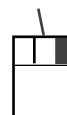
<left-mouse>........ Represents pressing the left-mouse button:
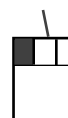
<middle-mouse>. Represents pressing the middle-mouse button:
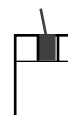
<right-mouse> .... Represents pressing the right-mouse button:

Note: Use the <left-mouse> to choose or select buttons unless otherwise specified.

Special Keys:

↵ .... Represents the <Enter> key on Hewlett-Packard or SUN workstations. Press the <Enter> key on the main section of the QWERTY keyboard when you see this symbol. On some other workstations, the same key is labelled "Return" and also has the ↵ symbol. Avoid using the key marked "Enter" on the right-hand keypad, which probably does not have the ↵ symbol on it.

<Shift> .... Press the <Shift> key. The Shift key augments other keys, and gives you capital letters and other special keyboard characters. It is always pressed in combination with other keys.

<Ctrl> .... Press the <Ctrl> key. The Ctrl key augments other keys, and is always pressed in combination with other keys.
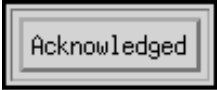
Special Widget Buttons:

CLOSE .... [CLOSE] button. Press this button to close pop-up menus when finished with them.

SAVE/CLOSE .... [SAVE/CLOSE] button. This button closes the current window and saves any parameters or other information that have been changed.

CANCEL/CLOSE .... [CANCEL/CLOSE] button. This button cancels any changes to parameters or other information in the current window, and exits the window.

OK ....[OK] button. Press this button to accept a statement or question that is presented in a window.

CLOSE .... [Cancel] button. Press this button to cancel any changes or other information requested in the window.

Acknowledged .... [Acknowledged] button. Any time this button appears in an information pop-up window, an important message is being displayed. RADS waits for you to read the special message. You must click on the "Acknowledged" button to continue.

Special Terms:

"current" .... The word "**current**" refers to something that is currently in use or currently active, and is used in a number of ways.

For example, when this documentation refers to the **current volume scan**, it is referring to the volume scan currently displayed and in use. A **current sweep**, or elevation angle, refers to the currently active sweep. RADS allows viewing of one volume scan and one associated sweep at a time (with the exception of the multi-panel display.)

"zoom" .... To "zoom" means to double the magnification factor. For example, to zoom an image that is being viewed at 2 times the normal size (2×) would result in a "4×" zoom. The current zoom factor is always shown at the bottom of the image window in the information area.

"double zoom" .... To "double zoom" means to quadruple the magnification factor of an image. For example, to double zoom an image that is being viewed at 2 times the normal size (2×) would result in a "8×" zoom. The current zoom factor is always shown at the bottom of the image window in the information area. Image zooms are always expressed in powers of two ($2^3 = 8×$ zoom).

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